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DELAWARE RIVER BASIN - ZONE 2

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REPORT ON WATER POLLUTION CONTROL

DELAWARE RIVER BASIN - ZONE 2

Prepared by

**U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
Public Health Service**

**Division of Water Pollution Control
North Atlantic Drainage Basins Office**

September 1952

In cooperation with the:

**New Jersey State Department of Health
Sanitary Water Board, Pennsylvania Department of Health
Interstate Commission on the Delaware River Basin**

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INTRODUCTION

The Federal Water Pollution Control Act, Public Law 845, passed by the 80th Congress in June of 1948, provided for full recognition of the primary responsibilities and rights of the States in controlling water pollution. It requires the Surgeon General of the Public Health Service to cooperate with other Federal agencies, with State and interstate water pollution control agencies, and with municipalities and industries in the preparation or adoption of comprehensive programs for eliminating or reducing the pollution of interstate waters and tributaries thereof, and improving the sanitary condition of surface and underground waters.

In developing these programs, due regard must be given to improvements necessary to conserve the Nation's waters for public water supplies, propagation of fish and aquatic life, recreational purposes, agricultural, industrial, and other legitimate uses.

As a first step in carrying out this requirement, the data available as of July 1, 1950, were presented in summary type reports covering the major drainage basins in the United States, the data concerning the Delaware River Basin being presented briefly in the summary report on the North Atlantic Drainage Basins.

The summary report considered the water pollution problems of the Delaware River Basin as a whole. This report contains pollution data available as of September, 1952 and relates to water pollution control measures in Zone 2 of the Delaware River Basin.

Water pollution control in this region has been given considerable study by the health agencies of the four States of New York, New Jersey, Pennsylvania and Delaware charged with this administrative responsibility, and the Interstate Commission on the Delaware River Basin, (Incodel), a joint cooperative agency maintained by the four States.

Pollution control activities of these agencies of the States are supported by their respective State laws relating to intrastate water pollution and the Incodel laws which have been passed by each of the States in the form of reciprocal legislation for the control of the interstate Delaware River and its tributaries.

The Incodel laws enacted, New Jersey - Chapter 146, July 1, 1939; New York - Chapter 600, May 31, 1939; Delaware - Chapter 93, May 8, 1941; and Pennsylvania - Chapter 123, April 19, 1945; provide for the minimum degree of treatment of wastes discharged in each of four zones of the Delaware River Basin.

ZONE 1: Zone 1 is that part of the Delaware River and its West Branch extending from the New York-Pennsylvania boundary line to the head of tidewater at Trenton, New Jersey and Morrisville, Pennsylvania.

The drainage basin contributory to this zone, excepting part of the Lehigh River Basin, is relatively sparsely inhabited and contains few sewered communities and relatively few industrial establishments producing

waste water. The streams draining this area being, in general, relatively clean and of high elevation, are well adapted as sources of public water supplies, after treatment or purification.

The principal uses of the waters of the Delaware River in Zone 1 are expected to be for water supply after such treatment or purification as may be necessary, and for recreation, bathing, maintenance of fish and aquatic life, agriculture, and for other related purposes.

ZONE 2: Zone 2 is that part of the Delaware River extending from the head of tidewater at Trenton, New Jersey and Morrisville, Pennsylvania, to a line drawn perpendicular to the channel of the Delaware River from the mouth of Pennypack Creek in Philadelphia, Pennsylvania, to the corresponding point on the New Jersey shore.

The drainage basin contributory to this zone is somewhat more densely populated than that of Zone 1, and it contains more sewered communities and industrial establishments.

The principal uses of the waters of the Delaware River in Zone 2 are expected to be for water supply, after treatment or purification, and for recreation, navigation, maintenance of fish and aquatic life, agricultural, industrial and other purposes.

ZONE 3: Zone 3 is that part of the Delaware River extending from the aforesaid line connecting the mouth of Pennypack Creek in Philadelphia and the corresponding point in New Jersey to the Pennsylvania-Delaware boundary line.

The drainage basin contributory to this zone contains populous metropolitan areas including Philadelphia, Pennsylvania and Camden, New Jersey.

The principal uses of the waters of the Delaware River in Zone 3 are expected to be for navigation, industrial water supply, and other purposes.

The water in this zone, however, should be of such sanitary quality that it will not be unfit for use as sources of water supply, will not be harmful to fish life, and will not adversely affect the quality of the waters of the tidal tributaries.

ZONE 4: Zone 4 is that part of the Delaware River extending from the Pennsylvania-Delaware boundary line to the Atlantic Ocean.

The principal uses of the waters of the Delaware River in Zone 4 are expected to be for navigation, industrial water supplies, commercial fishing, shellfish culture, recreation and other purposes.

This report describes the status as of September, 1952 of the water pollution control programs conducted by the New Jersey State Department of Health, the Sanitary Water Board of the Pennsylvania Department of Health and the Interstate Commission on the Delaware River Basin in that

portion of the drainage area contributory to Zone 2 of the Delaware River Basin. It sets forth information about the ways the water resources of the area are used, the pollution entering those water resources and the resulting damages, the benefits which may result from pollution prevention and abatement, pollution prevention measures in effect, and those which appear to be needed. Its scope is limited to surface water pollution control. Ground water pollution has not been considered in the report although usage of ground water is mentioned. While it is true that additional information is needed to complete the program, the objectives have been established and general plans for attaining them have been adopted by the States and Incodel. The program is well advanced with the major portion aimed toward completion by 1956.

The data on which this report is based have been compiled through and in cooperation with the New Jersey State Department of Health, the Sanitary Water Board of the Pennsylvania Department of Health and the Interstate Commission on the Delaware River Basin, (Incodel). Through these agencies additional data have been obtained from other State officials, municipal officials, and representatives of industry. Federal agencies also have cooperated.

The detailed data and remarks relating to individual sources of pollution appearing in Basic Data Tables 1 and 2, are the determination of the State water pollution control agencies and are included to illustrate the status of the program as of September 1952.

Comprehensive programs for pollution control must necessarily be fluid. They must allow for growth, development and changing conditions. The program now in effect in this area appears to fit the current needs. Reappraisal in the course of time will provide for adjustments as the need arises.

A sincere effort has been made by all who contributed to this report to present a fair picture of the complex water pollution problems in the Delaware River Basin - Zone 2, and to present reasonable conclusions and recommendations. It is our hope that this report will help in safeguarding the water resources in this area.

ACKNOWLEDGMENTS

The Public Health Service wishes to acknowledge the cooperation and assistance of those agencies and individuals that have contributed to the preparation of this report.

The New Jersey State Department of Health and the Sanitary Water Board in the Pennsylvania Department of Health, the water pollution control agencies of the respective States, have furnished the data from which the various tables were prepared and other data and information contained in the narrative statements. The Interstate Commission on the Delaware River Basin also supplied considerable data and assisted in drafting portions of the report. These agencies have, in addition, reviewed the preliminary draft of the report and offered valuable comments and suggested changes. The preliminary report has also been reviewed by the Delaware Water Pollution Commission and the New York State Department of Health. In general, the preliminary draft has been revised so that this report is in agreement with the comments and suggestions of the participating State and interstate agencies.

Federal agencies from which assistance was obtained include the Corps of Engineers, Department of the Army; the Geological Survey, and the Fish and Wildlife Service, Department of the Interior; the Bureau of the Census and the Weather Bureau, Department of Commerce; the Soil Conservation Service, Department of Agriculture; and the Federal Power Commission.

Finally, there is acknowledged the assistance of other State and Federal agencies and individuals interested in water resources development and conservation that have contributed information through other sources than those listed above.

SUMMARY

Zone 2 of the Delaware River is that part of the Delaware River extending about 25 miles from the head of tidewater at Trenton, New Jersey and Morrisville, Pennsylvania downstream to a line drawn perpendicular to the channel of the Delaware River from the mouth of Pennypack Creek in Philadelphia, Pennsylvania, to the corresponding point on the New Jersey shore. The drainage area contributory to Zone 2 is approximately 870 square miles. This region which is about 7% of the drainage area of the entire Delaware River Basin includes parts of Bucks, Philadelphia and Montgomery Counties in Pennsylvania and parts of Burlington, Mercer, Monmouth, Ocean and Camden Counties in New Jersey.

The 1950 population of the area was about 302,000 an increase of about 25% over the 1940 census. There are 76 political subdivisions in the area. These comprise 5 cities, 16 boroughs and 55 townships. The industries of the basin include the production of textile goods, stone, food products and other satellite industries. The Fairless Works of U.S. Steel Company will tremendously increase steel production in the area.

Water for domestic and industrial requirements is taken from both surface and underground sources. The public water supply systems serve about 38,000,000 gallons per day. Industrial establishments in the area use about 635,000,000 gallons of water per day. Of this amount 5 m.g.d. are furnished from the public water supply systems, 20 m.g.d. are obtained from private wells and the remainder from streams.

The streams of Zone 2 receive the waste waters discharged from 30 municipal sewer systems which serve a population of approximately 343,000 including about 75,000 which will comprise the population of the developments in Levittown and Fairless Hills, Pennsylvania, when completed.

Twenty-eight of the systems have sewage treatment plants which serve a population of about 268,000. Two systems which will serve about 75,000 persons have treatment plants under construction.

Wastes from 27 sources of industrial pollution are discharged directly to the streams. Eleven of the sources contribute organic wastes, eight inorganic wastes, and eight contribute both organic and inorganic wastes. One establishment which has facilities for treatment of its organic and inorganic wastes has not been placed in production. Data available for nine sources indicate the discharge of a pollution load having a population equivalent of about 33,000. Sixteen sources are provided with treatment works.

Recent soil surveys indicate that soil erosion is removing large quantities of valuable topsoil and land treatment measures are still needed for much of the area.

The discharge of untreated or inadequately treated municipal sewage or industrial wastes presents a potential danger to public health. Industries which find it necessary to use the river supply for industrial purposes are subject to the expense of water treatment. Discharges of domestic and industrial wastes have adversely affected fish life during periods of low flow in this section of the river.

The 28 sewage treatment plants serving about 268,000 persons consist of 7 primary treatment plants which serve about 182,000 persons and 21 secondary treatment plants which serve a population of approximately 86,000 and two secondary treatment plants under construction will serve a total population of about 75,000 in two housing developments under construction.

Of the nine municipalities with sources of pollution needing new or additional sewage treatment facilities, eight have plans which have been approved or are under preparation, and one has not reached the planning stage.

There are 13 industries needing projects for abatement of stream pollution. Four have works under construction, eight have plans approved or under preparation, and one has not reached the planning stage. In addition, one industry not yet in operation has a waste-treatment plant under construction and one with undetermined needs is in the active planning stage.

A list of the municipalities and industries needing improvements as of September 1952 for abatement of pollution in Zone 2 of the Delaware River Basin is set forth in Table J. Basic data as of September 1952 on the sources of municipal and industrial pollution in the Basin appear in Tables 1 and 2 in the Appendices.

The minimum requirements of Incodel for treatment of wastes discharged into Zone 2 of the interstate Delaware River are as follows:

ZONE 2: 1 - Such effluent shall be free of noticeable floating solids, color, oil, or grease, and practically free of both suspended solids and sleet.

2 - Such effluent shall be sufficiently free of turbidity that it will not cause noticeable turbidity in the water of the Delaware River.

3 - Such effluent shall show a reduction of organic substances of at least eighty-five (85) percent as measured by the bio-chemical oxygen demand, and furthermore, such effluent in no case shall exceed a bio-chemical oxygen demand of one hundred (100) parts per million, and furthermore, the discharge of such effluent, after dispersion in the water of the river, shall not cause a reduction of the dissolved oxygen content of such water of more than ten (10) percent. The aforesaid reduction in dissolved oxygen content shall be determined by the average results obtained by dissolved oxygen tests made upon samples collected on not less than six (6) consecutive days from points in the river above and below the point or points of effluent discharge.

4 - Such effluent shall be of such quality that the most probable number of organisms of the Coli Aerogenes group shall not exceed one (1) per milliliter in more than twenty-five (25) percent of the samples of sewage effluent tested by the confirmed test, and provided further that no single sample shall contain more than one hundred (100) organisms of the Coli Aerogenes group in one (1) milliliter.

5 - Such effluent shall be sufficiently free of acids, alkalis, and other toxic or deleterious substances, that it will not create a menace to the public health through the use of the water of the Delaware River for public water supplies, for recreation, industrial and other purposes; nor be inimical to fish, animal or aquatic life.

6 - Such effluent shall be free of offensive odors and also be free of substances capable of producing offensive tastes and odors in public water supplies derived from the Delaware River at any place above or below the discharge of such effluent.

During the post-war period of 1946 to 1951 inclusive, two new sewage treatment plants were constructed and three existing plants enlarged to serve a total population of 25,900. Thirteen new industrial waste treatment plants and enlargement of one existing plant were completed during the same period and five plants are under construction.

Progress in stream pollution control in Zone 2 of the Delaware River Basin has been steadily advancing for many years. As the pollution control laws in Pennsylvania and New Jersey were amended and strengthened better results in pollution abatement have been obtained. Both States have adequate water pollution control legislation and have made consider-

able progress in a coordinated program prepared some years ago by representatives of the New Jersey State Department of Health, the Sanitary Water Board of the Pennsylvania Department of Health and Incodal for the control of pollution in this section of the basin.

With the completion of the construction programs now scheduled, a considerable step forward will be realized toward restoring the water in Zone 2 of the Delaware River to a quality suitable for the expected principal uses as set forth in the objectives established by Incodal. However, much work remains to be done in providing adequate sewage treatment facilities for other municipalities in need of improved treatment plants and adequate waste treatment works to serve various industrial establishments.

A statistical summary of the data set forth in the report is shown in the following tabulation.

DELAWARE RIVER BASIN - ZONE 2

Summary Statistics on Pollution

September 1952

Extracted and Condensed from Tables in the Report

	<u>Sources of Pollution</u>	
	<u>Municipal</u>	<u>Industrial</u>
Number	30 (a)	27 (b)
Population Served	342,600 (a)	

EXISTING WASTE TREATMENT FACILITIES

	<u>Municipal</u>			<u>Industrial</u>		
	<u>Primary Treatment</u>	<u>Secondary Treatment</u>	<u>No Treatment</u>	<u>Treatment</u>	<u>No Treatment</u>	<u>Undetermined</u>
Number	7	23 (a)	-	16	10	1
Population Served	181,500	161,100(a)	-	-	-	-

WASTE TREATMENT NEEDS

	<u>Municipal</u>			<u>Industrial</u>		
	<u>No Project Needed</u>	<u>Project Needed</u>	<u>Undetermined</u>	<u>No Project Needed</u>	<u>Project Needed</u>	<u>Undetermined</u>
Number	21 (a)	9	-	10	13	4
Population Served	145,900 (a)	196,700	-			

STATUS OF ACTION ON TREATMENT NEEDS

	<u>Municipal</u>			<u>Industrial</u>		
	<u>Under Construction</u>	<u>Planning or Plans Approved</u>	<u>Inactive</u>	<u>Under Construction</u>	<u>Planning or Plans Approved</u>	<u>Inactive or Undeter.</u>
Number	2 (a)	8	1	5	9	1
Population Served	75,000(a)	191,300	5,400	-	-	-

- (a) Includes housing developments and municipal sewage treatment plants now under construction to serve a total population of about 75,000 in Levittown, Pennsylvania, and Fairless Hills, Pennsylvania.
- (b) Includes Fairless Works of the U.S. Steel Company not yet in operation. Sewage treatment plant completed; Industrial waste treatment facilities under construction.

CONCLUSIONS

A review of the data contained in the report indicates the following conclusions:

1. The Delaware River and the sections of the tributaries influenced by tidal action are of poor quality, particularly during minimum flow periods in late summer and fall.
2. The coordinated efforts of the New Jersey Department of Health, the Sanitary Water Board of the Pennsylvania Department of Health and Incodel are producing effective results in the program for the abatement of stream pollution in the area. The program underway is directed toward the elimination by 1956 of all discharges of pollution which do not meet the Incodel requirements.
3. Data concerning municipal sources of pollution are reasonably complete. Additional information is needed concerning the pollution load being discharged to the streams from industrial establishments.
4. The proposed Incodel water project for the Upper Delaware River Basin to provide for water storage, flood control and regulated increased low flows will improve the condition of Zone 2 of the Delaware River.
5. The development of the proposed channel enlargement between Philadelphia and Morrisville to serve industrial expansion is a factor that will require investigation to determine its probable effect on the quality of surface and ground waters.
6. Activities for informing the public of the necessity for municipal and industrial waste pollution abatement have been fruitful, especially where public approval for financing municipal projects has been necessary.

RECOMMENDATIONS

It is recommended that:

1. The New Jersey Department of Health, the Sanitary Water Board of the Pennsylvania Department of Health and Incodel continue their cooperative program to bring about water pollution control projects in a logical and equitable sequence for restoring and preserving the water resources of the region for their maximum appropriate usefulness.
2. Investigations into the sources of pollution, water use, requirements of water resources for municipal and industrial purposes and stream water quality surveys be continued to enable an appraisal of improvements resulting from pollution

control, the effects of future municipal and industrial expansion on stream conditions and to determine readjustments that may be needed to maintain the streams for their appropriate uses.

3. Efforts be continued toward the development of proper land use practices in the area for water and land resources conservation.
4. Investigation be made to determine the probable effects of the proposed Delaware River channel enlargement between Philadelphia and Morrisville on the quality of surface and ground waters. (See Appendix E - Review Comments - Corps of Engineers)
5. The State agencies charged with controlling stream pollution continue their efforts through public information programs to enlist public support for cleaning up pollution of the streams.

PHYSICAL DESCRIPTION

Zone 2 of the Delaware River Basin is situated in the southeastern part of Pennsylvania and the central western section of New Jersey. It consists of that part of the Delaware River extending about 25 miles from the head of tidewater at Trenton, New Jersey and Morrisville, Pennsylvania, downstream to a line drawn perpendicular to the channel of the Delaware River from the mouth of Pennypack Creek in Philadelphia, Pennsylvania to the corresponding point on the New Jersey shore.

The total drainage area contributory to Zone 2 is approximately 870 square miles. About 290 square miles of this total are located in Pennsylvania. Approximately 25% of Bucks County is included, 7% of Philadelphia County and 5% of Montgomery County. The area in New Jersey encompasses approximately 580 square miles, including about 50% of Burlington County, about 10% of Mercer, Monmouth and Ocean Counties and only 2% of Camden County.

About 7% of approximately 12,760 square miles of the Delaware River Basin is contained in Zone 2. This region is partly in the Piedmont Plateau and the Coastal Plain, the river draining the low, gently rolling agricultural land. The elevation ranges from sea level to approximately 250 feet, with a few hills of higher elevations up to 500 feet.

On the Pennsylvania side of the river the underlying formations are trap, sandstone, schist, shale, and gneiss with sand and gravel on the New Jersey side.

The open land is above average for agricultural purposes and yields considerable truck farm and other produce for the larger cities, including Philadelphia and New York. The area on the Pennsylvania side is also classified as urban, suburban and industrial. With the recent establishment of the Fairless Works of the U.S. Steel Company near Morrisville,

Pennsylvania, additional heavy future industrial growth is expected. The area contains only small scattered areas of woodland. The climate is temperate. Extremes in temperature have varied from 106°F to -18°F with the annual mean at about 52°F. Average summer temperature is about 76°F and during the winter the average is about 33°F. Normal annual precipitation is recorded as approximately 46.5 inches, with about 43 inches annual rainfall and about 27 inches of annual snowfall. Precipitation occurs rather uniformly throughout the year, between 3 and 4 inches per month on the average. The driest year of record was 1881, when the annual precipitation was 30.21 inches, while the wettest year was 1873, when the annual precipitation was 55.28 inches, as indicated by the records of the Pennsylvania Hospital. While flood control is important on the main stem of the Delaware River, it is not a major problem.

Streams flows are usually lowest during the months of August, September and October. There are 12 non-recording and 3 recording precipitation stations, and 6 stream gaging stations in Zone 2 of the Delaware River Basin.

Supplies of groundwater are available in sections of this region for present domestic and industrial use. Most of the drilled wells obtain their water supplies from sandstones, but a few obtain water from conglomerate and shales. Most rock formations contain numerous beds of sandstone that can generally be reached by wells of moderate depth. Shale yields small but generally reliable supplies. With very few exceptions, the ground waters from the region do not contain sufficient mineral matter of any sort to be unsatisfactory for drinking or cooking purposes, but some waters are hard and some contain objectionable amounts of dissolved iron.

A number of streams enter Zone 2 of the Delaware River. Among those in Pennsylvania are the Neshaminy Creek, Mill Creek and Poquessing Creek. In New Jersey, the Crosswicks Creek, Black's Creek, Assicunk Creek and Rancocas Creek enter the Delaware River. These streams have relatively small drainage areas, yet those of the Neshaminy, Crosswicks Creek and the Rancocas exceed 100 square miles each. They are located within the influence of tidal action along the Delaware River.

ECONOMIC DEVELOPMENT

This section of the Delaware River has seen a normal but modest increasing population trend for many years. With the location of the Fairless Works of the U.S. Steel Company near Morrisville, Pennsylvania, this region along both banks of the river will, no doubt, experience an upswing in population growth during the next decade. The 1950 population was about 302,000 of which about 109,000 resided in Pennsylvania and 193,000 in New Jersey - a population increase of approximately twenty-five percent over the 1940 figures. The region includes Trenton, the capitol of the State of New Jersey and parts of Mercer, Monmouth, Ocean, Burlington and Camden counties in New Jersey, and portions of Bucks, Montgomery and a small part of Philadelphia county in Pennsylvania. There are 76 political subdivisions in the area.

In the three counties in Pennsylvania, these comprise one city, 12 boroughs and 23 townships, while in the five counties in New Jersey there are 4 cities, 4 boroughs and 32 townships. Data on population are shown in Appendix A.

A portion of the basin is in the Penn's Manor dairy and poultry region, with its southern tip in the Philadelphia truck crop area. Above average and superior farm land with small scattered areas of woodland mainly comprise the land use. The industries of the basin include the production of textile goods, stone, food products and other allied satellite industries. With the advent of steel production near Morrisville, the area will no doubt undergo considerable changes. The lumbering industry, which once dominated river traffic, has been declining ever since it reached its peak about the turn of the century, although it remains a potential industry for the future.

Recently the Corps of Engineers has contracted the dredging of the river channel to the authorized depth of 25 feet between Philadelphia and Trenton. It has also recommended increasing this depth to 40 feet. This activity is caused by the recent development of Venezuelan iron ore deposits which it is proposed to bring by ship to the Fairless Works of the U.S. Steel Company near Morrisville. It is expected that the construction of steel mills in this region will highly industrialize this area and give to it a great economic impetus during the coming years.

PRESENT AND FUTURE USES OF WATER RESOURCES

The Delaware River and larger streams in Zone 2 are used extensively for municipal and industrial water supplies. In the New Jersey area, both Trenton and Burlington are served by the Delaware with about 28,000,000 and 1,000,000 gallons of surface water supply taken daily. Nearly all the remainder of public supplies in the New Jersey area are derived from underground sources. In the Pennsylvania portion, Bristol uses 3,000,000 gallons daily of Delaware River supply and, of course, the greatest user remains Philadelphia.

The City of Philadelphia water system which serves about 340,000,000 gallons per day to about 2,041,000 persons obtains approximately one-half of its water supply from the Schuylkill River and the remainder from the Delaware River at the Torresdale Plant located in Zone 2, about one mile upstream from Zone 3. In this way, the quality of the Delaware River in Zone 2 also directly affects the water supply of the great metropolis of Philadelphia.

The Philadelphia Suburban Water Company, which serves an area west of and adjacent to the entire westerly boundary of the City of Philadelphia, serves approximately 300,000 people and takes about 6,710,000 gallons per day from the Neshaminy Creek. It also obtains about 11,860,000 gallons per day from Pickering Creek, a tributary to the Schuylkill and an additional 17,560,000 gallons per day from Crum Creek, a tributary of the Delaware River in Zone 3, outside the area covered by this report. A

small amount is also obtained from Pennypack Creek in Zone 3, during peak periods when necessary.

In Zone 2, public water supplies are served to about 241,000 people by 13 municipally owned and 21 privately owned systems. The average daily water consumption from these systems in 1949 was about 38,000,000 gallons. This does not include any population or daily draft figure for the populations served by the City of Philadelphia's supply or the Philadelphia Suburban Water Company. Those values are more appropriately shown in the report on Zone 3, and are entirely omitted in the statistics given above because only a very small portion of this area is within Zone 2.

All public supplies from surface streams are filtered and chlorinated, and all but five underground sources are chlorinated. There are numerous private wells and springs in use for which no data are available, but a large percentage of the population of Zone 2 is within reach of public water supplies. Data on public water supplies are shown in Appendix B.

Industries have as a rule located along the rivers and tributary streams where the large volumes of water required are within easy reach. A survey in 1951 by Incodel shows that the industrial establishments along Zone 2 of the Delaware River use approximately 635,000,000 gallons of water per day. Of this amount, the public water supply systems furnish 2,000,000 gallons for domestic use within the industries and 3,000,000 gallons for industrial use. Private wells supply 20,000,000 gallons per day and 610 million gallons per day are obtained from the streams. The 1960 water requirements for the existing industrial concerns in this same area are estimated at 1,063 m.g.d. Most of the water used by the industries is returned to the streams.

The huge steel mills now being constructed near Morrisville will require huge quantities of water supplies, the bulk necessitated for cooling and quenching requirements. It is expected that the new Fairless Works of the U.S. Steel Company which is scheduled to start operations in 1952, will use about 250,000,000 g.p.d. of water of which 235,000,000 g.p.d. will be taken from the Delaware River. The additional 15,000,000 g.p.d. will come from wells. Meanwhile, the electric utilities that serve lower Bucks County in Pennsylvania and the nearby New Jersey communities are expanding. The Philadelphia Electric Company is making "a focal point" of the area with respect to its current construction program. A \$27,000,000 steam-electric generating station near Phoenixville, 35 miles west of the Fairless Works, will add 150,000 kilowatts to available power in 1954 and an additional 200,000 kilowatt unit in this station is scheduled for operation in 1955. Public Service of New Jersey also is in the midst of a big expansion and is spending \$140,000,000, part of this going for a 185,000 kilowatt unit at the Burlington steam-electric station scheduled for operation in 1954.

The operation of the Fairless Works will extend shipping activity to Zone 2 with ore and manufactured products as the chief articles of commerce.

The use of water for agricultural purposes is limited. Rainfall

generally meets agricultural requirements except during periods of severe droughts. There is little use made of irrigation except in the few special instances for horticultural and nursery stock development.

Limited sport fishing and swimming are available in Zone 2 of the Delaware River. Sport fishing in the tributary streams, above the influence of the Delaware River has shown a remarkable recovery with the aid of restocking by the States' fish and game commissions.

Commercial fishing, once a large source of income in the region, has practically died out. Shad catches in the Delaware, which were approximately 14 million pounds a year at the turn of the century, reduced to about 38,000 pounds in 1949.

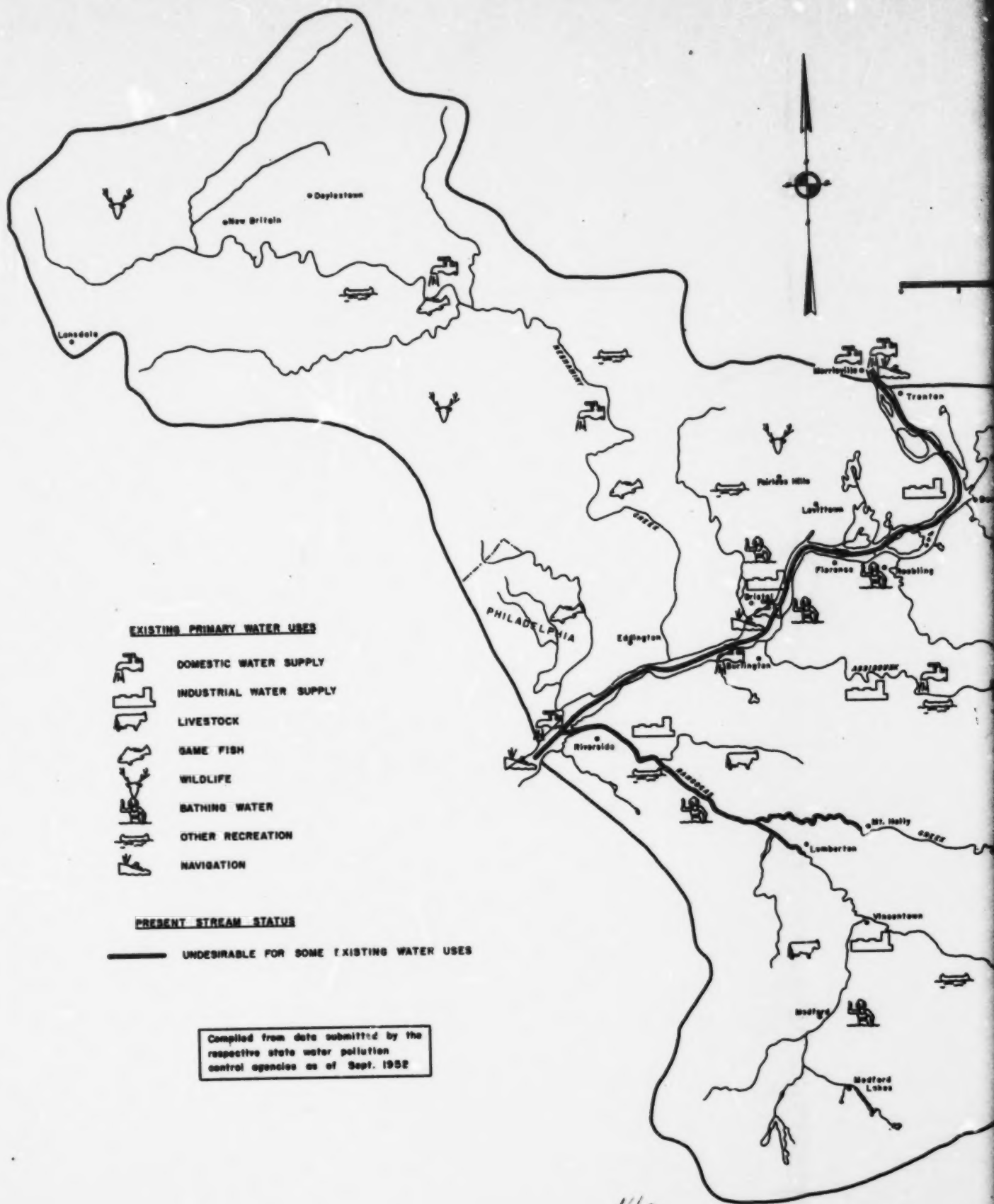
Boating basins are located in Zone 2. These are for the small pleasure craft type of boats.

IncodeI in 1949 was authorized by the States of New York, New Jersey and Pennsylvania to conduct an investigation to determine whether it may be advisable to construct an integrated water project in the Upper Delaware River Basin for their mutual use and benefit. The proposed Incodel Plan for the comprehensive development of the river recommended the establishment by compact of a Delaware River Water Commission with representation from New York, New Jersey, Pennsylvania and Delaware. New York, New Jersey and Delaware have passed legislation authorizing the creation of an interstate compact. Pennsylvania has deferred action pending further study of the plan by the Pennsylvania Water Resources Committee appointed by the Governor. The proposed Incodel plan provides for storage for water supply and stream flow regulation to increase the dry weather flows, improve the quality of the water in the lower Delaware and reduce salt water intrusion.

There is also under consideration a proposed project for the Corps of Engineers to enlarge the 31 mile stretch of the Delaware River channel from the Philadelphia Naval Base in Zone 3 to Newbold Island about six miles south of Trenton in Zone 2 to better serve the new Fairless Works of the U.S. Steel Company at Morrisville, Pennsylvania. The present authorized depth of the channel is 25 to 28 feet, although it has been maintained to a depth of only about 17 feet. The proposed channel will be 40 feet deep and 400 feet wide. Question has been raised concerning the further upstream movement of salinity in the lower Delaware and the effect on ground water resources that may result from construction of the project.

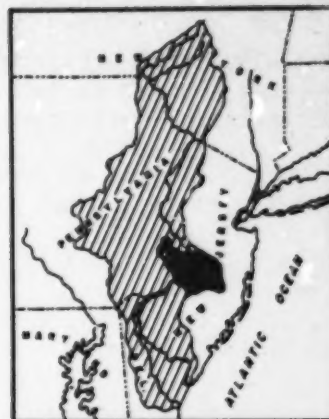
The development of either or both the Incodel plan and proposed Delaware River channel improvement will directly affect conditions in Zone 2 of the Delaware River.

The existing primary water uses and stream status are shown on Map No. 1.

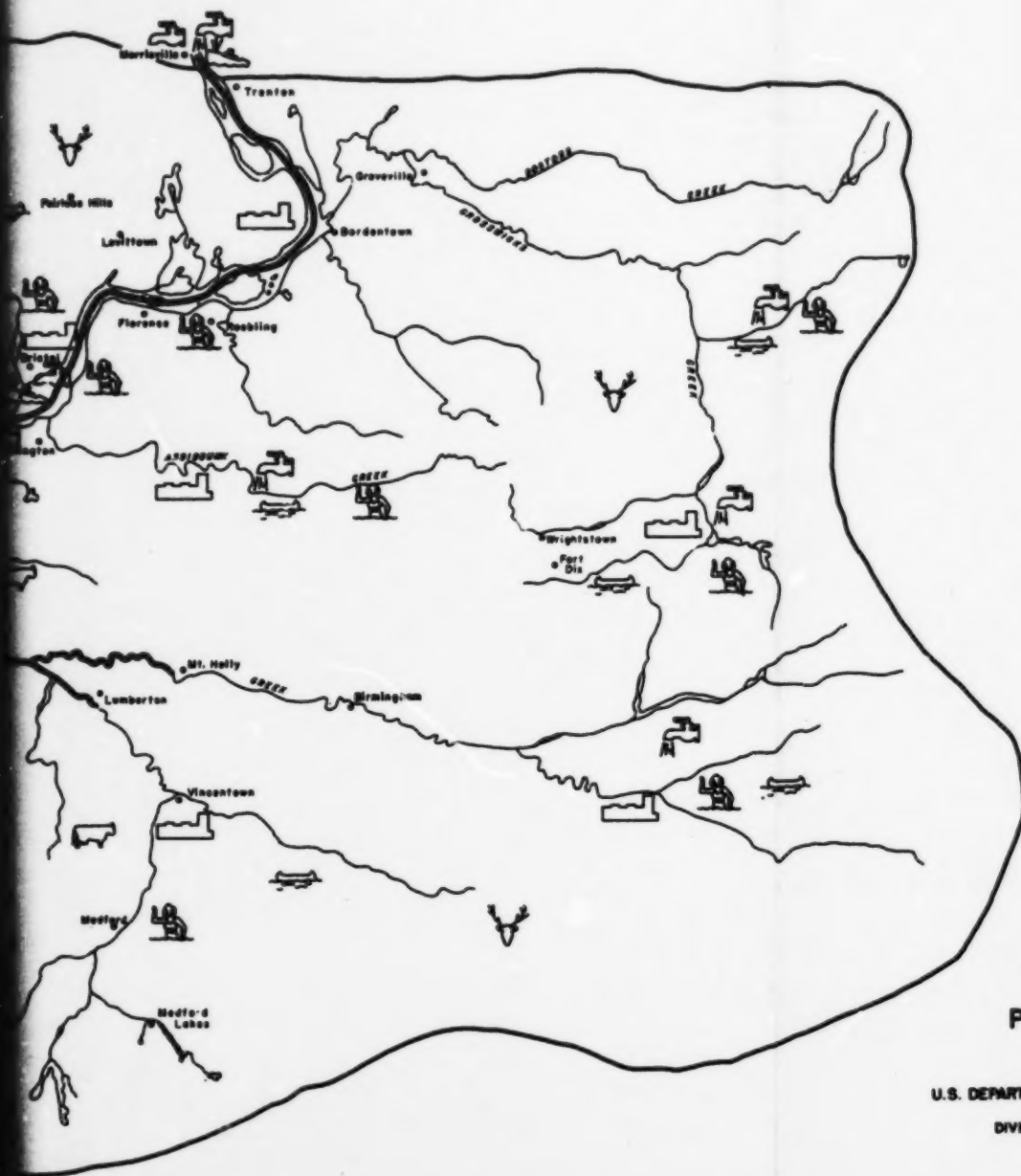




0 1 2 3 4 5 6 7 8 9 10 MILES



LOCATION MAP



**DELAWARE RIVER BASIN
Zone 2
PRIMARY WATER USES
AND
STREAM STATUS**

U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 1

Sept. 1952

POLLUTION CONTRIBUTED TO WATER RESOURCES

A summary of available data indicates there are 30 municipal sewer systems in Zone 2 of the Delaware River Basin. These systems serve a population of approximately 268,000 and will serve an additional population of about 75,000 upon completion of the housing developments and municipal sewage treatment projects in Levittown and Fairless Hills, Pennsylvania. These systems also serve many industries. Twenty-two of these systems serve a population of approximately 238,000 and discharge to the streams a pollution load estimated to be equivalent to that from a population of about 194,000 (Table A). Data are incomplete concerning the pollution load discharged from six systems which serve a total population of about 30,000, or about 11% of the people in the basin who are served by municipal sewer systems, not including the Levittown and Fairless Hills projects.

The major part of the pollution load is discharged from Trenton, New Jersey and Bristol, Pennsylvania where existing sewage treatment plants are inadequate. Trenton discharges a pollution load equivalent to that of about 160,000 persons while Bristol discharges a pollution load equivalent to that of about 14,000 persons. Treatment of these wastes will be provided for in expanded facilities now well into the planning stage in each of these municipalities.

Wastes from 27 sources of industrial pollution are discharged directly to the streams. One establishment has not been placed in operation. These industrial establishments consist of 19 sources which produce organic wastes and include eight which also produce inorganic wastes and eight which produce only inorganic wastes, (Table B). Data concerning the population equivalent of the industrial waste discharges are not available in most cases. However, nine establishments discharge a pollution load having a population equivalent of about 33,000. These establishments consist of two chemical, one primary metals, three fabricated metals, one food, and two textile plants.

Map No. 2 shows the sources of pollution and existing treatment facilities.

TABLE A

DELAWARE RIVER BASIN - ZONE 2

Sources of Pollution

September 1952

Municipal (*)

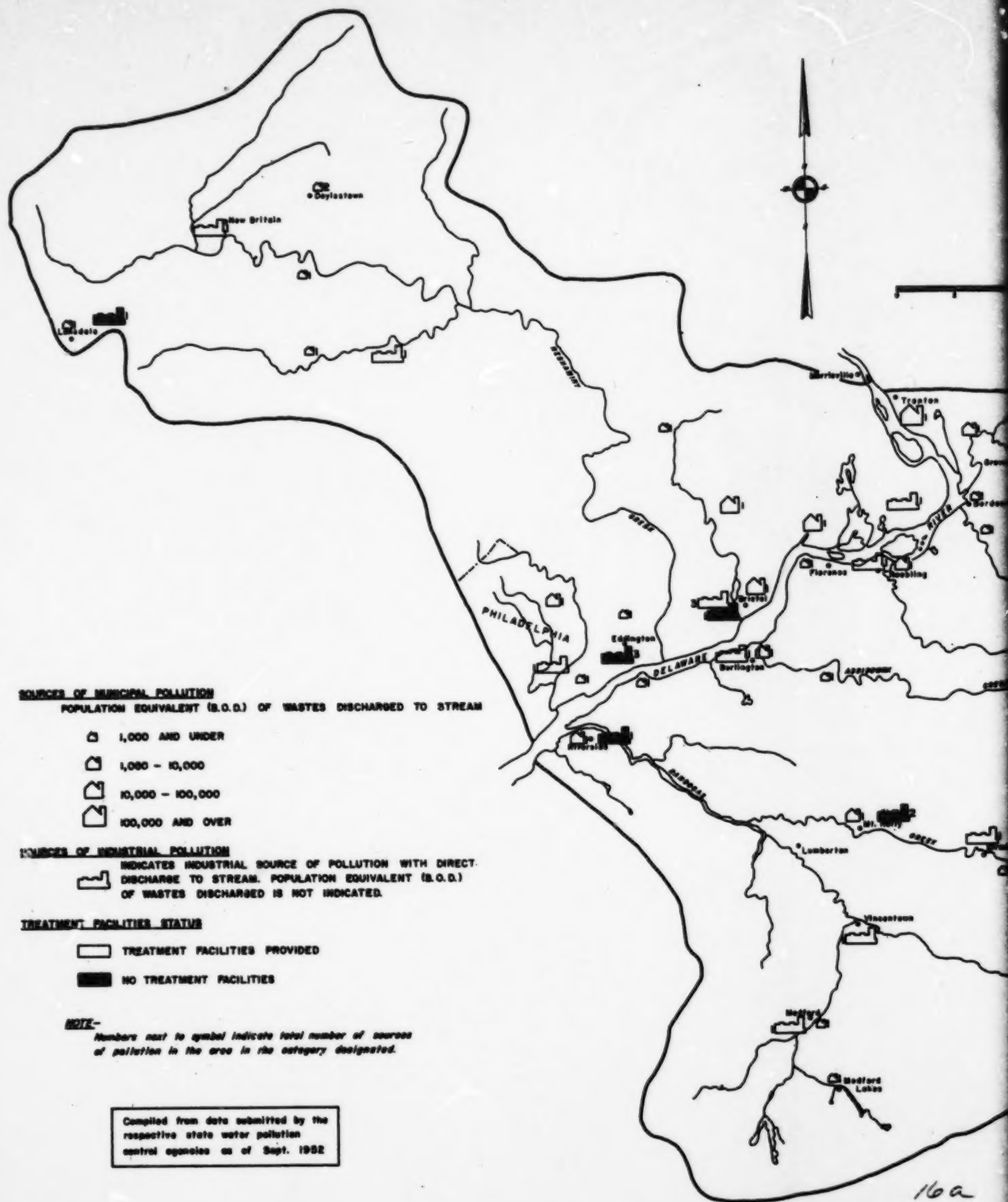
<u>Municipalities</u>	<u>Sources of Pollution (In Number of Municipalities)</u>	<u>Population Served by Sewerage System</u>	<u>Amount of Pollution Dis- charged to Water- course (In Terms of Equivalent Number of People) (**)</u>
Having data on pollution load discharged to watercourse	22	237,800	193,580
Having population data available (Data on pollution load to watercourse incomplete or not available)	8 (a)	104,800 (b)	- - - - -
TOTAL:	30 (a)	342,600 (b)	xxx xxx

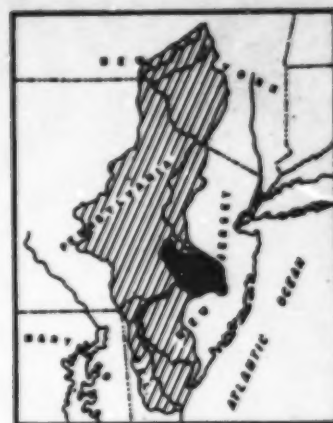
* Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers.

** Includes industrial wastes discharged into municipal sewerage systems.

(a) Population data not available for one source.

(b) Includes population of about 75,000 to be served in Levittown, Pa. and Fairless Hills, Pa. projects when housing developments and sewage treatment plants are completed.





LOCATION MAP



DELAWARE RIVER BASIN
Zone 2
**SOURCES OF POLLUTION
AND
EXISTING TREATMENT FACILITIES**
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 2
Sept. 1962

TABLE B

DELAWARE RIVER BASIN - ZONE 2

Source of Pollution

September 1952

Industrial (*)

<u>Industries</u>	<u>Sources of Pollution (In Number of Plants)</u>	<u>Amount of Pollution Discharged to Water- course (In Terms of Equiv. No. of People)**</u>
Producing Organic Wastes	9 (a)	32,620
Producing Organic Wastes	10 (b)	Undetermined
Producing Inorganic Wastes	16	Not Applicable
Producing Wastes of Undetermined Type	-	Undetermined
TOTAL:	27 (c)	XXXX

(a) Includes four plants which also produce inorganic wastes for which the population equivalent is known.

(b) Includes four plants which also produce inorganic wastes.

(c) Total adjusted to correct for duplication noted in footnote marked (a).

(*) Industries having separate outlets discharging wastes directly to watercourse. The wastes from industries which discharge into a municipal sewer system are included in the municipal discharge in Table A.

(**) Equivalent Population - The calculated population which would normally contribute the same amount of bio-chemical oxygen demand (B.O.D.) per day. A common base is 0.167 lb of 5-day B.O.D. per capita per day.

DAMAGES TO WATER RESOURCES FROM POLLUTION

This portion of the Delaware River Basin has sustained damage due to pollution. First and most outstanding from a public health standpoint is the damage to the water supply of Burlington, New Jersey and Bristol and Philadelphia in Pennsylvania as the result of the discharge of toxic industrial wastes and other pollution within Zone 2. Similarly, these supplies and the supply for Trenton, New Jersey have been affected by discharges of pollution in Zone 1 as occurred several years ago when industrial wastes were discharged from an insecticide plant some 30 miles upstream.

In Zone 2, some of the larger industries are located along the river because of their water needs and shipping requirements. These, too, are affected by the poor quality of the river water and are subject to the expense of treating the water to make it suitable for plant processes.

Real estate along the river has also depreciated because of pollution but is now regaining its value due to the clean-up program thus far effected, and industrial development.

Discharges of domestic and industrial wastes have adversely affected fish life during periods of low flow in this region. The shad fishery in the Delaware River was very extensive as far up as Port Jervis, but is now confined largely to the lower reaches of the River and the Bay below Pennsville. In the high waters of spring the adult fish swim upstream but the young cannot get downstream in August due to the oxygen depletion of the stream. This condition is not caused by pollution from Zone 2 alone but from pollution downstream as well.

Recent soil surveys indicate that sheet erosion is removing large quantities of valuable topsoil. It has been estimated that each square mile of land area in Zone 2 contributes annually 0.3 acre feet of sediment. This quantity is equal to over 11 million cubic feet, or approximately 104,000 tons, of material from the entire drainage area.

BENEFITS RESULTING FROM POLLUTION PREVENTION AND ABATEMENT

The coordinated program of the Interstate Commission on the Delaware River Basin being carried out by the New Jersey State Department of Health and the Sanitary Water Board of the Pennsylvania Department of Health, in conformity with the reciprocal (Incodel) agreement for the control of pollution in the waters of the Interstate Delaware River, and supported by other interested agencies, is eliminating the sources of pollution. The program is aimed toward substantial completion by 1956.

Each step in attaining this degree of recovery is providing a better water for domestic and industrial water supplies and reduces the cost of water treatment. A few industries have developed recovery processes which have reduced or eliminated pollution. In some cases the recovery of materials has netted financial returns. Examples of these

are the Superior Zinc Corp. of Bristol, Pennsylvania which recovers zinc from its waste waters and Rohm & Haas, also of Bristol, which recovers ammonium sulfate from its waste and uses it for fertilizer.

It is already evident that the improvement in the quality of the river is a factor in enhancing property values in New Jersey. In the Riverside section, Beverly, and Delanco, there is increased use of housing and in some cases housing which had formerly been abandoned because of pollution in the river is being reoccupied and has increased in value.

Stream pollution measures undertaken in recent years have improved conditions for the return of fish life. It has been reported that the numbers of mackerel, shad and herring have increased and fish are passing through Zone 2. During the spring of 1951 shad swimming up from the Delaware breakwater were reported in the vicinity of Lambertville which is about 16 miles above Trenton. Fingerling shad were found in the river above Milford in Zone 1. In the past the young shad returning downstream could not survive the pollution encountered in the lower river. It has been reported there are sufficient shad in the area to reproduce and return shad fishing to the Delaware within a few years after the stream has been improved to the point where the young shad will survive.

With the restoration of the river water quality increased use of the river for general recreational purposes is expected.

POLLUTION PREVENTION MEASURES IN EFFECT

Treatment Facilities

There are 28 municipalities operating sewage treatment plants which serve a population of approximately 268,000 in Zone 2 of the Delaware River. Seven of the treatment plants provide primary treatment and serve a population of about 182,000. Twenty-one secondary treatment plants serve about 86,000. Treatment facilities are under construction for two municipal systems which will serve a future population of 75,000 or 22% of the total population in Zone 2 served with municipal sewer systems. These represent the population which will be served by the Levittown and Fairless Hills sewage treatment plants when both developments are completed (Table C).

Sixteen of the industrial establishments are served by treatment facilities. No industrial waste treatment facilities are provided for ten establishments (Table D). Thirty-seven percent of the sources of pollution consist of metal industries. Other industries listed in order as to number of sources of pollution, are textiles, chemical, food, lumber, paper and mining. Three establishments which do not provide industrial waste treatment facilities now have such facilities under construction.

TABLE C

DELAWARE RIVER BASIN - ZONE 2

Existing Treatment Facilities

September 1952

Municipal (*)

<u>Degree of Treatment Provided</u>	<u>Number of Municipalities Served</u>	<u>Number of Treatment Plants</u>	<u>Population Served</u>
Primary	7	7 (a)	181,500
Secondary	23 (b)	23 (b)	161,100(b)(c)
No Treatment	-	-	-
TOTAL:	30	30	342,600 (c)

(*) Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers.

(a) Includes one municipality with minor treatment facilities.

(b) Includes Levittown, Pa. and Fairless Hills, Pa. where housing developments with municipal sewage treatment plants are under construction to serve a future population of 75,000.

(c) Population data not available for one source.

TABLE D

DELAWARE RIVER BASIN - ZONE 2

Existing Treatment Facilities

September 1952

Type of Industry	Number of Plants	Industrial (*)		
		Number of Industrial Plants Having:		
		Treatment Facilities	No Treatment Facilities	Undetermined Facilities
Food & Kindred	3	1	2	-
Textile	5	3	2	-
Lumber	1	-	1	-
Paper	1	1	-	-
Chemical	5	3	1	1
Primary Metals	4	3 (a)	1	-
Fabricated Metals	6	5	1	-
Other Mining	1	-	1	-
Miscellaneous	1	-	1	-
TOTAL:	27	16	10	1

(*) Industries having separate outlets discharging wastes directly to watercourse.

(a) Includes sewage treatment plant and industrial waste treatment plant at the Fairless Works of the U.S. Steel Company not yet in operation.

During the period 1946 to 1951 inclusive two new sewage treatment plants were constructed and three existing plants were enlarged to serve a total population of 25,900. Two sewage treatment plants now under construction will serve populations of 60,000 and 15,000 in Levittown and Fairless Hills. The primary treatment units of the Levittown plant are now in operation.

Thirteen new industrial waste treatment plants were constructed during the period 1946 - 1951 and one existing treatment plant was enlarged (Table E).

TABLE E

DELAWARE RIVER BASIN - ZONE 2

Progress in Construction of Pollution Abatement Facilities

Year	Municipal		Industrial	
	Sewage Treatment Plans Completed	Design Population	Waste Treatment Plants Completed	Amount of Waste Treated (In Terms of Equivalent No. of People)
1946	-		2 (a)	Data
1947	-		1	
1948-	-		-	not
1949	3 (1*)	15,355	3 (a)	available
1950	2 *	10,500	8(1*)(b)	
1951	-		-	

(a) One plant not listed on Table 2 or any other tabulation in this report.

(b) Three plants not listed on Table 2 or any other tabulation in this report.

(*) Enlargement or additions

Incodel Requirements

The control of wastes discharged into the waters of Zone 2 of the Delaware River and its tributaries is under the jurisdiction of the New Jersey State Department of Health and the Sanitary Water Board of the Pennsylvania Department of Health. Each State has laws controlling the discharge of wastes into the waters of the respective States. In addition the States have enacted laws known as the Incodel Act, which provides minimum treatment requirements for all wastes discharged into the Delaware River and the maintenance of the waters of any intrastate tributary of the Delaware immediately above its confluence with the Delaware River in a condition at least equal to that in the Delaware River immediately above the confluence of such tributary. The Incodel laws enacted in these two States are New Jersey - Chapter 146, July 1, 1939 and Pennsylvania - Chapter 123, April 19, 1945. There is close cooperation between the State health departments and Incodel, with Incodel acting as the coordinating agency.

The minimum requirements of Incodel for treatment of wastes discharged into Zone 2 of the interstate Delaware River are as follows:

Zone 2; 1. Such effluent shall be free of noticeable floating solids, color, oil, or grease, and practically free of both suspended solids and sleet.

2. Such effluent shall be sufficiently free of turbidity that it will not cause noticeable turbidity in the water of the Delaware River.

3. Such effluent shall show a reduction of organic substances of at least eight-five (85) percent as measured by the biochemical oxygen demand, and furthermore, such effluent in no case shall exceed a bio-chemical oxygen demand of one hundred (100) parts per million, and furthermore, the discharge of such effluent, after dispersion in the water of the river, shall not cause a reduction of the dissolved oxygen content of such water of more than ten (10) percent. The aforesaid reduction in dissolved oxygen content shall be determined by the average results obtained by dissolved oxygen tests made upon samples collected on not less than six (6) consecutive days from points in the river above and below the point or points of effluent discharge.

4. Such effluent shall be of such quality that the most probable number of organisms of the Coli Aerogenes group shall not exceed one (1) per milliliter in more than twenty-five (25) percent of the samples of sewage effluent tested by the confirmed test, and provided further that no single sample shall contain more than one hundred (100) organisms of the Coli Aerogenes group in one (1) milliliter.

5. Such effluent shall be sufficiently free of acids, alkalis, and other toxic or deleterious substances, that it will not create a menace to the public health through the use of the water of the Delaware River for public water supplies, for recreation, industrial and other purposes; nor be inimical to fish, animal or aquatic life.

6. Such effluent shall be free of offensive odors and also be free of substances capable of producing offensive tastes and odors in public water supplies derived from the Delaware River at any place above or below the discharge of such effluent.

State Laws and Regulations

Pollution prevention measures in New Jersey are based upon two laws, both enacted in 1899 and later amended and supplemented. One of these laws, "An Act to secure the purity of public supplies of potable waters", prohibits the discharge of excremental matter, industrial wastes or other polluting matter into water later used for potable purposes; as well as the deposition of such materials upon the banks of such waters. However, "An Act to regulate the discharge of effluents from sewage systems or works into potable waters," (Act of 1921), provides that effluents from sewage and industrial waste treatment plants may be discharged into waters later used for public potable purposes; provided, that, in the opinion of the State Department of Health, such effluents discharged will or may not cause or threaten injury to the users of any of such waters. The second law, the State Sewerage Act, applies to all waters of the State. Under the provisions of this law, the State Department of Health is granted the following authority: (1) to investigate the various methods of sewage or

waste disposal in order that it may make proper recommendations in regard thereto; (2) to require that anyone polluting the waters of the State in such manner as to cause or threaten injury to any inhabitants of the State, either in their health, comfort or property, cease such pollution; (3) to require alterations, additions or improvements to sewage or industrial waste treatment works; (4) to establish the conditions under which any sewer, drain or sewerage system shall be built; and (5) to establish the conditions under which any plant for the treatment of sewage or other polluting substance shall be built or operated. The law provides, further, that before the building of any plant for the treatment of sewage or other polluting substances, the plans shall be submitted to the State Department of Health for approval.

The program for abatement of stream pollution in Pennsylvania is conducted by the Sanitary Water Board, an agency within the Department of Health, under the Pennsylvania Anti-Pollution Act of 1937 as amended in 1945. The first phase of the program which involves the issuance of orders to municipalities and industries which are polluting the waters of the State to abate the discharges of such pollution or submit to the Board plans of corrective measures for approval is practically completed in Zone 2 of the Delaware River Basin. The second phase is concerned with the construction and operation of the required waste treatment facilities. Following approval of the detailed plans the Board issued orders requiring construction and operation of the approved facilities on or before specified dates. This phase of the program in Zone 2 of the Delaware River is also well advanced. New or reopened industrial establishments must provide for adequate waste treatment before beginning operations.

To assist in the first phase of its program, the State of Pennsylvania after the issuance of a permit approving the plans for sewage treatment, makes Grant-in-Aid payments to the municipalities, from State funds, up to 50% of the cost of the plans for sewage treatment works, based upon the 1942 price level. The Grant-in-Aid is toward the cost of the plans for sewage treatment works, including intercepting sewers, pumping stations and related appurtenances but not lateral collecting systems. No funds are provided to assist in the construction of such facilities.

Specific standards have been adopted by the Pennsylvania Sanitary Water Board for certain industrial wastes including milk processing wastes, colliery silt, acid pickling waste waters, wastes arising from the manufacture of pulp, paper, paper board and similar products, oil and natural gas wells, wastes from other wells, phenolic bodies, oil bearing wastes, distillery wastes, tannery waste waters and mine drainage. The discharge of cyanides to the waters of the State is prohibited. In general the standards set forth values representative of standard raw waste characteristics which serve as the basis upon which the required degree of treatment is applied.

Provisions for financing the construction and operation of municipal sewage treatment plants are contained in the laws of the respective States.

The debt limit in New Jersey is 7% of the average assessed

valuations of real property, including improvements for municipalities; and 4% for counties. A municipality with indebtedness over the limit may incur new debt only within the limitations of the statute, which in brief are the orders of a superior governmental authority, such as an order of the State Department of Health, to construct a sewer; capital debt for emergency purposes such as fire, flood or other disaster; the refunding of floating debt with the consent of the State Funding Commission; and the incurring of general debt based on the amount of debt retired in a prior year. The latter is a limited power provided by statute to take care of cases where certain capital expenditure should be incurred which do not fall in any of the exempted classifications. A municipality may incur debt in excess of statutory limitations, if it has been found by the State Department of Health, and an order issued, that the expenditure is necessary to protect the public health and to prevent or suppress a present menace to the public health of sufficient gravity to justify the incurrence of the debt, and that no less expensive method of preventing or suppressing such menace exists.

New Jersey also has statutes under which sewer districts within a municipality or covering a complete municipality or two or more municipalities may be formed. The State also has a sewer rental law, under which sewerage works may be constructed and maintained as separate entities within other local government structures. The State also has a sewerage authority law. Sewerage authorities may encompass a part of a municipality, a total municipality or two or more municipalities. Sewerage authorities are separate entities which operate, after appointment, independently of the local governing body.

The Anti-pollution Laws of Pennsylvania contain provisions relating to the financing of the construction of municipal sewage treatment plants. Municipalities which are ordered to construct sewage treatment plants and do not have sufficient funds on hand must acquire such funds through a bond issue. If direct obligation bonds cannot be issued because of constitutional debt limitations or failure to get consent of the electors, financing can be done by the establishment of a municipal authority to construct, improve, maintain and operate sewers and sewage treatment works. A municipal authority is created by the governing body of the governmental subdivision by passage of an ordinance and the members of the authority are appointed by the governing body which creates the authority.* The existence of an authority is limited to 50 years and it must procure a charter from the State before it can operate. In such cases a system of sewer rental charges is practically always adopted as the method for financing the sewage treatment facilities. The Pennsylvania Supreme Court in a recent case ruled that municipal authorities may assess charges against adjoining property owners to defray the expense of building a sewer.

Financing of industrial waste treatment facilities is entirely the responsibility of the industry. In the case of the marginal industry operating in keen competition, the cost of treatment facilities is sometimes a major item of expense.

* Financing Sewage Treatment Works - Pamphlet issued by the Sanitary Water Board, Pennsylvania Department of Health.

Other Measures in Effect

Through the activities of the State Extension Services and the U.S. Soil Conservation Service progress is being made in soil and forest conservation although soil conservation districts have been organized in only about half of the area in Zone 2. Districts, which are the local organizations that coordinate soil conservation work including the activities of the Soil Conservation Service, have not been established in Bucks and Montgomery Counties in Pennsylvania. Incodel in cooperation with these agencies is active in the development of conservation projects particularly on the small watersheds in the area.

The Interstate Commission on the Delaware River Basin has no enforcement powers. It is engaged in the formation and execution of a coordinated, unified plan looking toward the wise use, development, and control of the resources of the Delaware River Basin as a whole. Through its cooperation with Federal, State and numerous local agencies and organizations substantial strides are being made in the pollution control program in Zone 2 of the Delaware River Basin. Effective educational work is carried on to acquaint the public with the problems to be solved, procedures for accomplishing the control of pollution, and development of the overall program in the basin.

In Pennsylvania the Sanitary Water Board has an extensive educational program underway to enlist the support of the public and industry in the Board's program to control pollution of the streams. This activity is conducted through the use of periodicals, colored posters, mailing leaflets, special articles for technical publications, motion pictures, radio, press, working models of installations, the extensive use of photographs and by participation in meetings of civic, technical and other educational groups.

In New Jersey surveys and corrective action in pollution abatement are progressing.

A cooperative sanitary survey of the Delaware River by the City of Philadelphia Water Department, the U.S. Geological Survey and Incodel has been underway since August 1949 in this area. Five samples are collected monthly at each of eight sampling stations on the section of the river extending from the Burlington-Bristol Bridge to the Pennsylvania-Delaware State line. Analytical data have not been correlated with stream flow records and other conditions but the results do indicate an improvement in the quality of the water during the period of the survey.

Data concerning the quality of the water in Zone 2 of the Delaware River are shown in Appendices C and D.

POLLUTION PREVENTION MEASURES NEEDED

Two new sewage treatment plants, under construction, for Fairless Hills and Levittown in Pennsylvania will serve a population of 75,000, or about 22% of the total population served by municipal sewer facilities in Zone 2 of the Delaware River Basin (Table F). Eight existing plants which serve a population of about 196,000 are in need of enlargement or additions and one plant serving 700 needs replacement. Of these six are primary treatment plants and three are secondary plants. Nineteen plants which serve a population of approximately 71,000 or about 21% of the population served with municipal sewer facilities, are adequate and need no projects.

Of the 8 sewage treatment plants in need of enlargement or additions, seven serve municipalities and one serves an institution. The municipalities which have final plans approved or are in the active planning stage include Bristol and Lansdale in Pennsylvania, and Trenton, Florence Twp., Burlington and Riverside Twp. in New Jersey.

The plant serving Pemberton, New Jersey needs replacement. Final plans have been approved for this project.

Data concerning industrial waste pollution abatement needs (Table G) indicate that corrective measures are needed at 13 industrial establishments or about 48% of those which discharge wastes directly to the streams in the basin. Of the 13 establishments in need of pollution control measures, five need new waste treatment plants or other control measures, four industries need enlargement or additions to existing treatment facilities, and four are negotiating with municipalities for disposal of wastes into municipal sewer systems. Ten establishments are not in need of projects and information is incomplete concerning four establishments. Of the 13 establishments in need of pollution control measures 4 are related to the textile industry, 3 metals, 3 food, 1 chemical, 1 lumber and one to an industry in the miscellaneous group.

Pollution abatement needs are shown on Map No. 3.

Considerable progress is being made in the program for the control of pollution from municipal sources in Zone 2 of the Delaware River Basin. All the municipal sources undergo some degree of treatment. Five municipalities are in the active planning stage for sewage treatment facilities to serve approximately 173,300 persons and final plans have been approved for three municipalities which will construct plants to serve a population of about 18,000 (Table H).

TABLE F

DELAWARE RIVER BASIN - ZONE 2

Waste Treatment Needs

September 1952

Municipal (*)

<u>Needs</u>	<u>Number</u>	<u>Population Served by Facilities</u>
New Plant	-	-
Enlargement or Additions to Existing Plant	8	196,000 (a)
Replace Existing Plant	1	700 (b)
No Project Needed	21	145,900 (c)(d)
Undetermined	-	-
TOTAL:	30	342,600 (c)

(*) Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers.

(a) Includes one plant which needs chlorination.

(b) Existing plant with minor facilities to be replaced with a new plant.

(c) Includes new plants under construction to serve future population of 75,000 in Levittown, Pa. and Fairless Hills, Pa.

(d) Population data not available for one plant.

TABLE G

DELAWARE RIVER BASIN - ZONE 2

Waste Pollution Abatement Needs

September 1952

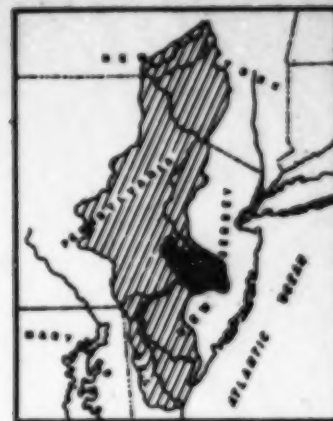
Industrial (*)

<u>Needs</u>	<u>Number</u>
New Treatment Plant or Other Pollution Control Measures	5
Enlargement or Additions to Existing Plant	4
Connection to Municipal Sewer System	4
No Project Needed	10
Undetermined	4
TOTAL:	27

* Industries having separate outlets discharging wastes directly to watercourse.



28a



LOCATION MAP



Ba

DELAWARE RIVER BASIN
Zone 2
POLLUTION ABATEMENT NEEDS
U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE
Public Health Service
DIVISION OF WATER POLLUTION CONTROL
MAP NO. 3
Sept. 1962

TABLE H

DELAWARE RIVER BASIN - ZONE 2

Status of Municipal (*) Action on
Pollution Abatement Needs

September 1952

<u>Status of Action</u>	<u>Number of Municipalities</u>	<u>Population Served</u>
Inactive	1	5,400
Active Planning (a)	5	173,300
Final Plans Approved (b)	3	18,000
Under Construction	2	75,000 (c)
TOTAL	11	271,700

- (*) Includes incorporated or unincorporated municipalities; other legal bodies as sanitary districts, counties, towns; significant institutions, resorts, recreational centers or other population centers.
- (a) Includes preliminary action such as securing engineering services, making survey, preliminary plans, arranging for purchase of site, developing financial program, studying means for additional treatment, or consideration of joint treatment with industry or other municipalities.
- (b) Includes plans approved by State Water Pollution Control Agency or Final plans submitted to said Agency for approval.
- (c) Housing developments and sewage treatment plants to serve future population in Levittown, Pa. and Fairless Hills, Pa.

At present, Bordentown, New Jersey is considered inactive. However, its plant is satisfactory in both capacity and operation and its needs are the addition of chlorination units to its treatment process.

There are five industrial establishments which have construction of waste treatment facilities underway (Table I). These are the Warner J. Steel Company, Inc. at Bristol, Pennsylvania and the Fairless Works of the U.S. Steel Company at Morrisville, Pennsylvania and in New Jersey the Riverside Metals Company at Riverside Twp., the Ankocas Dyeing & Processing Company at Mount Holly and the Eagle Dyeing and Finishing Company also at Mount Holly.

Active planning is underway by eight industries for corrective measures to control stream pollution. The Hercules Powder Company, Burlington Twp., New Jersey has plans approved for the enlargement of its existing waste treatment facilities.

Land treatment measures are still needed for much of the land in the area. They should be based on the principle of treating the land according to its needs and using it according to its capabilities.

Much has been done to alleviate pollution in Zone 2 of the Delaware River Basin but continued activity is necessary to bring about further abatement to restore the Delaware River to the desired quality of water for the expected principal uses of water supply (after treatment or purification) recreation, navigation, maintenance of fish life, agricultural, industrial and other purposes.

TABLE I

DELAWARE RIVER BASIN - ZONE 2

Status of Industrial (*) Action on
Pollution Abatement Needs

September 1952

<u>Status of Action</u>	<u>Number of Industries</u>
Inactive	1
Active Planning (a)	8
Final Plans Approved (b)	1
Under Construction	5
	15 (c)

- (*) Industries having separate outlets discharging wastes directly to watercourse.
- (a) Includes preliminary action such as securing engineering services, making survey, preparing plans, arranging for purchase of site, developing financial program, studying need for additional, joint or pre-treatment, pilot plant operation, internal process changes, or negotiations with municipality to enter municipal sewer system.
- (b) Includes plans approved by State Water Pollution Control Agency, final plans submitted to said Agency for approval or permission granted by municipality for connection to municipal sewer system.
- (c) Includes one industry with undetermined needs which is in the active planning stage and one industry not yet in operation which has a treatment plant under construction.

A list of the municipalities and industries needing improvements as of September 1952 for abatement of pollution in Zone 2 of the Delaware River Basin is set forth in Table J. Basic data as of September 1952 on the sources of municipal and industrial pollution entering Zone 2 are presented in Tables 1 and 2 of the Appendices.

TABLE J

DELAWARE RIVER BASIN - ZONE 2

**Municipalities and Industries Needing Improvements
for Abatement of Pollution***

September 1952

New Jersey

Bordentown

(Mount Holly)

Ankokas Dyeing & Processing Co.**

Burlington✓

Eagle Dyeing & Finishing Co.**

(Burlington Twp., Burlington Co.)
Hercules Powder Co.

Pemberton

Florence Twp., Burlington Co.
Florence Section
J.A. Roebling Sons Co.

Riverside Twp., Burlington Co.
Riverside Section
Riverside Metals Co.**

(Groveville)
Anchor Thread Co.

(Vincentown)
Stokes Canning Co.

Trenton

Pennsylvania

(Bensalem Twp.)
Eppinger & Russel

(Eddington)
Hillcrest Dairy

Bristol
The Manhattan Soap Co.
Warner J. Steel Co. Inc.**

Landsdale
(Morrisville)
Bucks County Farm Dairies

(Doylestown)
National Agricultural College

(Warminster)
Fischer and Porter Co.

* For details see Tables Nos. 1 and 2. This table does not include municipalities or industries listed with needs undetermined.

** Needed improvements are under construction.

() Municipalities enclosed by parenthesis are not in need of improvements and only indicate the location of the industrial establishment.

BASIC DATA TABLES

The data as of September 1952 listed on the following Basic Data Tables were reported by the New Jersey Department of Health and the Sanitary Water Board of the Pennsylvania Department of Health. They are arranged by watershed area which enables the reader to isolate, for any particular area, the amounts and kinds of pollution being discharged and the adequacy of treatment, where provided. The principal stream is listed first, starting with the sources of pollution farthest upstream and continuing down to the mouth. Each tributary along with its branches are then covered in downstream order. Those branches which receive no pollution are not listed, while those receiving pollution from municipal sources will be found in Table 1 (Municipal) and similarly, those receiving industrial pollution in Table 2 (Industrial).

The reader is cautioned not to assume the entries as listed to be final. Changing conditions in water uses, pollution contributed, stream quality, information obtained during surveys and other circumstances, may dictate readjustments.

Table 1 applies to municipalities. Included but not listed are those industries discharging wastes into municipal sewers. Table 2 applies to industries discharging directly to a watercourse.

To aid in finding the location of the various sources of pollution, a stream code and river mileage system has been devised. The pollution points on any stream are listed in downstream order beneath the name of that stream, accompanied by its distance in river miles from the mouth of the stream. Tributary streams are further identified by a symbol indicating the stream to which they are tributary and a mileage number indicating in river miles the point at which they join the larger stream. With this information any source of pollution may be located with respect to the mouth of the main stream of the Basin.

Example: To locate the outfall of Doylestown, Pennsylvania, listed in Table 1. It is found that Doylestown discharges to Cook's Run 2.6 miles from its mouth. Cook's Run (Ne-36.5) enters Neshaminy Creek 36.5 miles from its mouth. Neshaminy Creek (D-67.3) flows into the Delaware River at a point 67.3 miles from its mouth at Liston Point, Delaware, which has been established as the zero point for the river system covered in this report. Accordingly, Doylestown, Pennsylvania, is 106.4 stream miles above the mouth of the Delaware River at Liston Point.

Stream Code

Zero Mileage - Liston Point, Del.
and Hope Creek, N.J.
D - Delaware River

TABLE 1

DELAWARE RIVER BASIN - ZONE 2

Basic Data on Sources of Municipal* Pollution

September 1952

Name and Location <u>DELAWARE RIVER</u>	River Mile Above Mouth	Popu- lation Served by Sewers	P.E. (B.O.D.) Untr't. Wastes	Waste Treatment Provided	P.E. (B.O.D.) Discharged to Watercourse	Treatment Needs	Remarks Status
Trenton, N.J.	84.0	141,800	231,000	Primary	160,000	Addition	Secondary treatment and chlorination req'd. Active planning
Bordertown Industrial School, Bordertown, N.J.	80.0	500	500E Primary	250	None		
Florence Twp., Roebing Sect., N.J.	76.8	3,400	9,300 Secondary	1,170	None		
Florence Twp., Florence Sect., N.J.	75.1	1,200E	1,200 Primary	400	Addition		Secondary treatment req'd. Active Planning
Levittown, Pa. a)	74.7	60,000E	N Secondary	N	None		Secondary plant under con- struction, primary treat- ment in operation.

E - Estimated

N - Unknown, P.E. - Population Equivalent, D.O.D. - Biochemical Oxygen Demand
* Includes incorporated or unincorporated municipalities; other legal bod'ys as sanitary districts, counties,
towns; significant institutions, resorts, recreational centers or other population centers.

** These figures do not include population equivalent of industrial wastes discharged to sewer systems, if any.

a) Housing development with "complete" sewage treatment plant to serve 60,000 population is under construction,
primary treatment in operation.

Stream Code

D - Delaware River

Cr - Crosswicks Creek (D-80.6)

TABLE 1

DELAWARE RIVER BASIN - ZONE 2

Basic Data on Sources of Municipal Pollution

September 1952

Name and Location	River Mile Above Mouth	Popu- lation Served by Sewers	P.E. (B.O.D.) Untr't. Wastes	Waste Treatment Provided	P.E. (B.O.D.) Discharged to Watercourse	Treatment Needs	Remarks Status
<u>DELAWARE RIVER (cont)</u>							
Bristol, Pa.	71.0	17,000E	N	Primary	13,500E**	Enlargement	Abatement ordered. Final plans approved for secondary treatment. Bond issued for construction approved.
Burlington, N.J.	70.3	12,300	13,000E	Primary	7,100	Addition	Secondary treatment req'd. Active planning
Beverly, N.J.	66.6	3,100	N	Secondary	N	None	
<u>CROSSWICK CREEK D-80.6</u>							
State Prison Farm, Bordentown Twp., N.J.	6.9	N	N	Secondary	N	None	
Hamilton Twp., N.J.	3.4	29,000	41,500	Secondary	6,930	None	
<u>SOUTH RUN Cr-24.2</u>							
Fort Dix, Burlington Co., N.J.	4.6	10,000E	N	Secondary	500	None	
<u>NORTH RUN Cr-22.7</u>							
Wrightstown, N.J.	5.2	1,100	1,100E	Secondary	150	None	
N - Unknown							

Stream Code
 O - Otter Cr. (D-70.8)
 D - Delaware River
 Ne - Neshaminy Creek (D-67.3)

TABLE 1

DELAWARE RIVER BASIN - ZONE 2
 Basic Data on Sources of Municipal Pollution

September 1952

Name and Location	River Mile Above Mouth	Popu- lation Served by Sewers	P.E. (B.O.D.) Untreated Wastes	Waste Treatment Provided	P.E. (B.O.D.) Discharged to Watercourse	Treatment Needs	Remarks Status
<u>BLACK'S CREEK D-80.4</u>							
Bordertown, N.J.	1.5	5,400	5,500E	Secondary	400	Chlorination	Inactive
<u>MILL CREEK O-0.6</u>							
Woods School, Middletown, Pa.	8.6	700	N	Secondary	100E	None	
<u>ASSISICUNK CREEK D-70.6</u>							
Masonic Home Burlington Twp., N.J.	1.9	300	300E	Secondary	150	None	
<u>NESHAMINY CREEK D-67.3</u>							
Buck's County Home, Doylestown Twp., Pa.	30.0	200E	N	Secondary	50E	None	
Fairless Hills, Pa. b)	5.1	15,000E	N	Secondary	-	None	Secondary treatment plant under construction
<u>WEST BRANCH NESHAMINY CREEK Ne-38.5</u>							
Landedale, Pa.	4.5	10,000E	N	Secondary	N	Enlargement	Abatement ordered. Active planning

N - Unknown
 b) Housing development with sewage treatment plant to serve 15,000 population is under construction.

Stream Code

Ne - Neshaminy Creek (D-67.3)
R - Rancocas Creek (D-62.9)

TABLE 1

DELAWARE RIVER BASIN - ZONE 2

Basic Data on Sources of Municipal* Pollution

September 1952

Name and Location	River Mile Above Mouth	Popu- lation Served by Sewers	P.E. (B.O.D.) Untr't. Waste	Waste Treatment Provided	P.E. (B.O.D.) Discharged to Watercourse	Treatment Needs	Remarks Status
<u>COOK'S RUN Ne-36.5</u>							
Doylestown, Pa.	2.6	5,000E	N	Secondary	600E**	None	
National Agricultural College, Doylestown, Pa.	0.7	300E	N	Secondary	150E	Enlargement	Final plans approved
<u>LITTLE NESHAMINY CREEK Ne-22.1</u>							
Christ Home for Children Warminster Twp., Pa.	5.0	400E	N	Secondary	50E	None	
<u>TRIBUTARY TO NESHAMINY CREEK Ne-1.0</u>							
St. Francis Industrial School, Bensalem Twp., Bucks County, Pa.	1.2	300E	N	Secondary	50E	None	
<u>POQUESSING CREEK D-63.5</u>							
Ryberry State Hospital, Phila., Pa.	5.1	8,000E	N	Secondary	N	None	
St. Elizabeth Convent Bensalem Twp., Pa.	1.5	300E	N	Secondary	50E	None	
N - Unknown							

Stream Code

R - Rancocas Creek (D-62.9)
 Rs - South Branch Rancocas
 Creek (R-7.8)

TABLE 1

DELAWARE RIVER BASIN - ZONE 2

Basic Data on Sources of Municipal* Pollution

September 1952

Name and Location	River Mile Above Mouth	Popu- lation Served by Sewers	P.E. (B.O.D.) Untr't. Waste	Waste Treatment Provided	P.E. (B.O.D.) Discharged to Watercourse	Treatment Needs	Remarks Status
<u>RANCOCAS CREEK D-62.9</u>							
Riverside Twp., N.J. Riverside Sect.	0.9	8,000	11,000E	Primary	N	Additions Chlorination	Abatement ordered. Active planning of secondary treatment and chlorination facilities.
<u>NORTH BRANCH RANCOCAS CREEK R-7.8</u>							
Burlington Co. Inst., N.J.	9.5	600	350	Secondary	300	None	
Mount Holly, N.J.	4.0	7,800	8,000E	Secondary	1600	None	
Pemberton, N.J.	12.6	700E	N	Minor c)	N	New Plant	Final plans approved 1-52
<u>HAYNES CREEK Ra-5.2</u>							
Medford Lakes, N.J.	6.5	100	100	Secondary	50	None	
Medford Twp., N.J.	3.5	100	97	Secondary	30	None	

c) Minor - Screening Plant
 N - Unknown

Stream Code

Zero Mileage - Liston Point,
Delaware & Hope Creek, N.J.
D - Delaware River

TABLE 2

DELAWARE RIVER BASIN - ZONE 2

Basic Data on Sources of Industrial* Pollution

September 1952

Name and Location	River Mile Above Mouth	Type of Industry	Type Waste Produced	Degree of Treatment	P.E. (B.O.D.)		Pollution Abatement Needs	Remarks Status
					Discharged to Watercourse			
<u>DELAWARE RIVER</u>								
Bucks County Farm Dairies, Morrisville, Pa.	83.0	Food & Kindred Products	Organic	None	N		Connect to mun. sewer	Planned for disposal into proposed Borough sewer system
U.S. Steel Company Fairless Works, Falls Twp., Bucks County, Pa.	82.0	Primary Metals	Inorganic	Secondary	N		None	Under construction
U.S. Steel Company Fairless Works, Falls Twp., Bucks County, Pa.	82.0	Primary Metals	Organic (Sewage)	Secondary	N		None	Population to be served - 9,000
J.A. Roebbling Sons Co., Florence Twp., N.J.	77.0	Primary Metals	Organic	Primary	3,200		Addition or improve operations	14 mgd of oil and acid wastes. Engr. engaged - Active planning
Kaiser Metal Prod. Inc. #2, Bristol, Pa.	71.6	Fabr. Metals	Inorganic	Secondary	N		None	
Kaiser Metal Prod. Inc. #1, Bristol, Pa.	71.5	Fabr. Metals	Inorganic	Secondary	N		None	

N - Unknown

* Industries having separate outlets and discharging wastes directly to watercourse.

Stream Code
D - Delaware River

TABLE 2
DELAWARE RIVER BASIN - ZONE 2
Basic Data on Sources of Industrial Pollution

September 1952

Name and Location	River Mile Above Mouth	Type of Industry	Type Waste Produced	Degree of Treatment	P.E. (B.O.D.) Discharged to Watercourse	Pollution Abatement Needs	Remarks Status
<u>DELAWARE RIVER (cont)</u>							
The Manhattan Soap Co., Bristol, Pa.	71.2	Miscellaneous	Organic & Inorg.	None	N	Connect to mun. sewer	Abated discharge except one for which company is negotiating to discharge to Borough sewer system.
Patterson Parchment Paper Co., Bristol, Pa.	71.0	Paper	Organic	Primary	N	None	
Heroules Powder Co., Burlington Twp., N.J.	70.1	Chemical	Organic	Secondary	300	Enlargement	Plans approved 2-52
Hillcrest Dairy Eddington, Pa.	66.6	Food & Kindred Products	Organic	None	N	New Plant	Abatement order- ed. Inactive
Eppinger & Russell, Bensalem Twp., Bucks County, Pa.	66.2	Lumber & Wood Products	Inorganic	None	N	New Plant	Wood cressoting wastes. Abate- ment ordered. Active planning
Publicker Industries Inc., Bensalem Twp., Bucks County, Pa.	66.1	Chemical	Inorganic	Secondary	N	None	No discharge at present.

Stream Code
D - Delaware River
No - Neshaminy Creek (D-67.3)

TABLE 2

DELAWARE RIVER BASIN - ZONE 2

Basic Data on Sources of Industrial* Pollution

September 1952

Name and Location	River Mile Above Mouth	Type of Industry	Type Waste Produced	Degree of Treatment	P.E. (B.O.D.) Discharged to Watercourse	Pollution Abatement Needs	Remarks Status
<u>DELAWARE RIVER (cont)</u>							
Cornwells Chemical Corp., Bensalem Twp., Bucks County, Pa.	66.0	Chemical	Inorganic	None	N	Undeter.	
<u>CROSSWICKS CREEK D-80.6</u>							
Anchor Thread Co., Groveville, N.J.	6.2	Textile	Organic & Inorg.	Primary	N	Addition	Abatement ordered 6-52
<u>OTTER CREEK D-70.8</u>							
Warner J. Steel Co., Inc., Bristol, Pa.	0.3	Textile	Organic	Primary	N		Conne. to Pre-treatment works mun. sewer under construction
Bohm and Haas Bristol Twp., Bucks County, Pa.	0.1	Chemical	Organic & Inorg.	**	N		Under Sanitary Water Board order to abate discharge; company has instituted a major pro- ject aimed at effecting abate- ment. Facilities for treat- ment and recovery of wastes have been installed at a cost of \$1,200,000.

Stream Code

TABLE 2

D - Delaware River
Ne - Neshaminy Creek (D-67.3)

DELAWARE RIVER BASIN - ZONE 2

Basic Data on Sources of Industrial* Pollution

September 1952

Name and Location	River Mile Above Mouth	Type of Industry	Type Waste Produced	Degree of Treatment	P.E. (B.O.D.) Discharged to Watercourse	Pollution Abatement Needs	Remarks Status
<u>NESHAMINY CREEK D-67.3</u>							
Victor Silk Hosiery Co., New Britain, Pa.	37.0	Textile	Organic	Inter- mediate	N	Undet.	
<u>WEST BRANCH</u>							
<u>NESHAMINY CREEK Ne-38.5</u>							
Nyce Crete Co., Landsdale, Pa.	4.5	Other Mining	Inorganic	None	N	Undet.	
<u>LITTLE NESHAMINY CREEK Ne-22.1</u>							
Fischer and Porter Co. Warminster, Bucks County, Pa.	4.0	Fabr. Metals	Organic & Inorg.	None	N		Connect to Negotiating to man. sewer dispose of sewage and in- dustrial wastes to Hatboro sewer system.
Naval Air Modification Unit, Warminster Twp., Bucks County, Pa.	3.0	Fabr. Metals	Organic & Inorg.	Secondary	700E	None	
<u>POQUESSING CREEK D-63.5</u>							
Yale & Towne Mfg. Co., Phila., Pa.	2.0	Fabr. Metals	Organic & Inorg.	Secondary	200E	None	

Stream Code
D - Delaware River
R - Rancocas Creek (D-62.9)
Re - South Branch,
Rancocas Creek (R-7.8)

TABLE 2
DELAWARE RIVER BASIN - ZONE 2
Basic Data on Sources of Industrial* Pollution

September 1952

Name and Location	River Mile Above Mouth	Type of Industry	Type Waste Produced	Degree of Treatment	P.E. (B.O.D.) Discharged to Watercourse	Pollution Abatement Needs	Remarks Status
RANCOCAS CREEK D-62.9							
Riverside Metals Co., Riverside Twp., N.J.	1.5	Primary Metals	Inorganic	None	N	New Plant	Oil & Acid wastes. Under construction
NORTH BRANCH							
RANCOCAS CREEK R-7.8							
Permutit Co., Birmingham, N.J.	8.3	Fabr. Metals	Organic	Inter- mediate	50	None	
Ankatas Dyeing & Processing Co., Mount Holly, N.J.	4.0	Textile	Organic	None	1730	New Plant	Under construction
Eagle Dyeing & Finish- ing Co., Mount Holly, N.J.	4.0	Textile	Organic & Inorg.	None	9250	New Plant	Under construction
SOUTH BRANCH							
RANCOCAS CREEK R-7.8							
Stokes Canning Co., Vincentown, N.J.	7.7	Food & Kindred Products	Organic	Secondary	17,100-	Enlargement	Active Planning
HAYNES CREEK Re-5.2							
Zeolite Chemical Co., Medford, N.J.	3.5	Chemical	Organic & Inorg.	Primary	90	None	

APPENDIX A

DELAWARE RIVER BASIN - ZONE 2

Population - Counties - Incorporated Municipalities

<u>Pennsylvania</u>	<u>1940</u>	<u>1950</u>
<u>Bucks County</u> 144,620 (1950) 107,715 (1940)		
<u>Boroughs</u>		
Bristol	11,895	12,710
Chalfont	670	828
Doylestown	4,976	5,262
Hulmeville	694	860
Ivyland	318	358
Langhorne	1,221	1,579
Langhorne Manor	477	781
Morrisville	5,493	6,787
Newton	2,009	2,095
Tullytown	562	648
<u>Montgomery County</u> 353,068 (1950) 289,247 (1940)		
<u>Boroughs</u>		
Watfield	1,301	1,624
Landsdale	9,316	9,762
<u>Philadelphia County</u> 2,071,605 (1950)		
* Philadelphia City) 1,931,334 (1940)	11,000	11,000

* Partly in Basin

APPENDIX A
Cont'd

<u>New Jersey</u>	<u>1940</u>	<u>1950</u>
<u>Burlington County</u> 135,910 (1950) 97,013 (1940)		
Beverly City	2,691	3,084
Bordentown City	4,223	5,497
Burlington City	10,905	12,051
Medford Lakes	137	461
Pemberton	906	1,194
Wrightstown	241	1,199
<u>Camden County</u> 300,743 (1950) 255,727 (1940)		
<u>Mercer County</u> 229,781 (1950) 197,318 (1940)		
*Trenton City	31,200	32,000
<u>Monmouth County</u> 225,327 (1950) 161,238 (1940)		
<u>Boroughs</u>		
Allentown	766	931
<u>Ocean County</u> 56,622 (1950) 37,706 (1940)		
	<u>91,191</u>	<u>110,711</u>

Delaware Zone 2 - Estimated Population 1950

16 Boroughs	47,079
5 (2*) Cities	63,632
55 (33*) Townships	<u>191,289</u>
	302,000

* Partly in Basin

APPENDIX B

DELAWARE RIVER BASIN - ZONE 2

Public Water Supply Data

Municipality	Str.* Well	Spr. Owner	Pop. 1940	Est. Pop. Served 1949	Av. Plant Output G.P.D. 1949	Treatment	
						Filt.	Chlor. None
New Jersey							
Allentown	x	M	766	700	30,000	x	x
Beverly (a)	x	P	2,691	13,500	340,000	x	x
Bordentown (b)	x	x M	4,223	5,800	700,000	x	x
Burlington (c)	x	M	10,905	11,500	1,349,000	x	x
Burlington Twp., Burlington Co. Masonic House		P		No data			
Columbus	x	P	595	200	6,000	x	x
Chesterfield Twp., Burlington Co., Crosswicks Sect.							
Florence Twp., Burlington Co.	x	x P	(275)	500	48,000		x
Lumberton Twp., Burlington Co.	x	M	7,229	7,050	1,300,000	x	
	x	P	1,007	500	64,000		x

a) Also serves Delanco Twp., Delran Twp., Edgewater Park Twp., and Riverside Twp.
b) Also serves Bordentown Twp., Fieldboro, Hamilton Twp. in Mercer Co. (part)
c) Also serves Springside

* Abbreviations Used: G.P.D. - Gallons per day, M - Municipal, P - Private, Filt - Filtration, Chlor - Chlorination

Str. - Stream, Spr. - Spring, Est. Pop. - Estimated Population, Av. - Average
Source - Inventory of Water & Sewage Facilities 1949 Public Health Service

APPENDIX B

DELAWARE RIVER BASIN - ZONE 2

Public Water Supply Data

Municipality	Str. Well	Spr. Owner	Pop. 1940	Est. Pop. Served 1949	Av. Plant Output G.P.D. 1949	Treatment		Remarks
						Filt.	Chlor. None	
<u>New Jersey (cont)</u>								
Medford Twp., Burlington Co.								
Lake Pines Sect.	x	P	-	250	-		x	
Medford Sect.	x	P	-	1200	61,000		x	
Taunton Lakes Sect.	x	P	-	100	6,100			x
Mt. Holly Twp. d)								
Burlington Co.	x	P	6,892	7200	314,000	x	x	
Pemberton	x	M	906	800	-		x	
Pemberton Twp., Burlington Co.								
Browns Mills Sect.	x	P	2,386	1900	-		x	x
Southampton Twp., Burlington Co.	x	P	1,813	800	17,000		x	
Trenton	x	M	124,697	142,000	28,000,000	x	x	Delaware River
Wrightstown	x	P	241	-	-		x	
<u>Pennsylvania</u>								
Bristol e)	x	M	11,895	12,950	3,000,000	x	x	Delaware River, drilled well

d) Also serves Hainesport Twp., Lumberton Twp. (part).
e) Also serves Edgely

d) Also serves Hainesport Twp., Lumberton Twp. (part).

e) Also serves Edgely

APPENDIX B

DELAWARE RIVER BASIN - ZONE 2

Public Water Supply Data

Municipality Pennsylvania (cont)	Str. Well	Spr. Owner	Pop. 1940	Est. Pop. Served 1949	Av. Plant Output G.P.D. 1949	Treatment		Remarks
						Filt.	Chlor. None	
Chalfont	x	M	670	670	30,000			x
Christ Home for Children, Bucks Co.	x	P	(350)	350	20,000			x
Colmar	x	P	(500)	150	6,000		x	
Cornell Heights, Bucks Co.	x	P	(400)	200	20,000		x	
Doylestown	x	M	4,976	4,900	320,000		x	
George School	x	P	(350)	350	40,000			x
Hatfield	x	M	1,301	1,000	100,000		x	
Lacey Park Housing Project, Bucks Co.	x	M	-	4,500	300,000		x	
Langhorne f)	x	P	1,221	3,100	300,000	x	x	Creeks & wells
Lansdale	x	P	9,316	9,300	700,000		x	
Morrisville	x	M	5,493	6,100	600,000	x	x	Delaware River
National Agricul- tural College, Bucks Co.-		P	(200)	250	20,000		x	

f) Also serves Hulmeville, Langhorne Manor, Middletown Twp., and South Langhorne

APPENDIX B

DELAWARE RIVER BASIN - ZONE 2

Public Water Supply Data

Municipality Pennsylvania (cont)	Str. Well	Spr. Owner	Pop. 1940	Est. Per. Served 1949	Av. Plant Output G.P.D. 1949	Treatment		Remarks
						Filt.	Chlor. None	
Newtown	x	P	(2000)	2,360	150,000		x	
Philadelphia g) (Torresdale Plant)	x	M	1,931,334	1,075,000	175,300,000	x	x	Delaware River
Philadelphia h) Suburban Water Co.	x	P	-	(70,000)	5,600,000	x	x	Neshaminy Creek (Imp) Middletown Plant (Bucks Co.)
St. Francis Indus- trial School, Bucks Co.	x	P	(325)	325	20,000		x	
Trevose	x	M	(300)	300	5,000		x	

g) Also obtains from the Schuylkill River 164.6 M.G.D. which is treated in five filtration plants and served to a population of 966,000.

h) Also obtains 10.2 M.G.D. from Crum Creek, 0.5 M.G.D. from Pennypack Creek and 9.0 M.G.D. from Pickering Creek. Operates four filtration plants and serves total population of about 300,000 in 25 boroughs and 23 townships including 35 unincorporated communities in Bucks, Chester, Delaware and Montgomery Counties in an area west of and adjacent to the entire westerly boundary of the City of Philadelphia.

APPENDIX B

DELAWARE RIVER BASIN - ZONE 2

Public Water Supply Data

Owner - Treatment	Stream Well Spring			Number of Water Systems	Estimated Population Served - 1949	Average Plant Output O.P.D. 1949	
<u>New Jersey</u>							
<u>Municipal</u>							
Filtration	3	1	-	3	154,200	29,379,000	a) Includes only a portion of the City of Philadelphia supply system.
Chlorination	-	3	1	3	13,650	2,000,000	
None	-	-	-	-	-	-	
	3	4	1	6	167,850	31,379,000	
<u>Private</u>							
Filtration	-	1	-	1	7,200	314,000	b) Includes only a portion of the Philadelphia Suburban Water Company system.
Chlorination	-	6	-	6	17,600	424,000	
None	-	3	1	5 c)	1,350	118,100	
	-	10	1	12	26,150	856,100	
<u>Pennsylvania</u>							
<u>Municipal</u>							
Filtration a)	3	1	-	3	1,094,050	178,900,000	c) Includes one for which data was not available.
Chlorination	-	4	1	4	10,700	725,000	
None	-	1	-	1	670	30,000	
	3	6	1	8	1,105,420	179,655,000	
<u>Private</u>							
Filtration b)	2	1	-	2	73,100	5,900,000	
Chlorination	-	4	-	4	9,900	746,000	
None	-	4	-	4	3,385	230,000	
	2	9	-	10	86,385	6,876,000	
TOTAL:	8	29	3	36	1,385,805	218,766,100	

APPENDIX C

DELAWARE RIVER WATER ANALYSES

Sampling Station	Date	Dissolved Oxygen ppm	% Sat.	B.O.D. ppm
<u>1/</u> Morrisville, Pa.	1949 July 28	9.8	128.	7.5
	Aug. 16	10.2	124.	5.2
	Sept. 20	9.5	106.	2.9
<u>2/</u> Bristol, Pa.	1949 Aug.	6.3	-	-
	Sept.	6.6	-	-
	Oct.	7.2	-	-
	1950 June	6.4	-	2.5
	July	4.0	-	2.5
	Aug.	6.3	-	1.0
	Sept.	5.8	-	4.0
	Oct.	7.3	-	2.6
	1951 June	6.8	-	2.6
	July	6.5	-	1.6
<u>2/</u> Philadelphia, Pa. (Torresdale)	Aug.	7.1	-	1.7
	Sept.	6.8	-	3.5
	Oct.	7.7	-	3.0
	1949 Aug.	7.1	-	10.4
	Sept.	7.0	-	.9
	Oct.	4.4	-	1.0
	1950 June	5.9	-	1.2
	July	4.4	-	1.8
	Aug.	5.6	-	2.3
	Sept.	5.5	-	2.3
1951	Oct.	6.1	-	0.2
	June	6.7	-	2.4
	July	5.4	-	2.3
	Aug.	6.1	-	2.7
	Sept.	5.5	-	1.8
	Oct.	4.9	-	4.3

1/ From "Report on The Utilization of the Waters of the Delaware River Basin prepared by Malcola Pirnie Engineers - Albright & Friel, Inc. for the Interstate Commission on the Delaware River Basin.

2/ Preliminary Com-pilation from unpub-lished records; Dela-ware River Sanitary Survey - City of Philadelphia & U.S. Geological Survey.

Five samples are taken monthly at each of 8 points in the River. These samples are taken at the east & west shorelines, at the center channel, and midway between the center channel and the shoreline.

APPENDIX D

Delaware River at Morrisville, Pa. - Chemical Analyses in parts per million

Date of Collection	Temperature °F	Color	pH	Specific Conductance (Microhm/cm @ 25°C)	Silica (SiO ₂)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium Na	Potassium (K)	Bicarbonate (HCO ₃)	Sulfate (SO ₄)	Chloride (Cl)	Nitrate (NO ₃)	Hardness as CaCO ₃	
															Total	Non-Carbonate
Water Year																
Oct. '46 -																
Sept. '47																
Mean Discharge in sec.-ft.	Min.	34	6.6	82	1.6	0.02	8.6	2.6	1.7	18	17	17	2.4	1.4	52	15
	Av.	56	7.0	127	3.8	0.05	14.	4.4	3.9	35	23	23	4.4	3.2	80	24
	Max.	79	7.4	174	5.4	0.12	19.	6.4	6.1	52	29	29	7.0	4.8	116	31
13,620																
Water Year																
Oct. '47 -																
Sept. '48																
Mean Discharge in sec.-ft.	Min.	-	6.7	73	3.0	0.02	10	3.3	4.7	16	14	14	3.5	1.9	72	16
	Av.	-	-	144	-	-	-	-	-	47	23	23	-	-	-	-
	Max.	-	7.8	206	6.8	0.04	21	7.0	9.0	70	33	33	8.5	5.8	127	34
12,820																
Water Year																
Oct. '48 -																
Sept. '49																
Mean Discharge in sec.-ft.	Min.	35	6.0	83	2.1	0.01	8.1	2.7	4.4	18	16	16	2.0	1.2	58	17
	Av.	58	-	151	-	-	-	-	-	43	24	24	-	3.1	-	-
	Max.	84	7.9	222	6.2	0.16	21	7.3	9.1	69	34	34	12	4.1	129	30
10,970																

(-) Not reported

1/ "Chemical Character of Surface Water in Pennsylvania - 1946 to 1949" Publication 23 of the Pennsylvania Department of Commerce State Planning Board

APPENDIX E

DEPARTMENT OF THE ARMY
Office of the Chief of Engineers
Washington 25, D. C.

15 May 1953

Dr. Leonard A. Scheele
Surgeon General
U. S. Public Health Service
Department of Health, Education and Welfare
Washington 25, D.C.

Dear Dr. Scheele:

Reference is made to letter of 1 April 1953 from your service inclosing a report by the Public Health Service on water pollution control in Zone 2 of the Delaware River Basin, New Jersey and Pennsylvania. I am pleased to offer the following comments.

Your report on water pollution control of the Delaware River Basin, prepared in cooperation with the New Jersey State Department of Health, the Sanitary Water Board of the Pennsylvania Department of Health, and the Interstate Commission on the Delaware River Basin (INCODEL), studies in detail, the reach of the Delaware River from the head of tidewater at Trenton, New Jersey, to the mouth of Pennypack Creek in Philadelphia, Pennsylvania, together with the tributary drainage area for this reach. The report describes the present and future uses of the water resources of the area; pollution loadings contributed to the surface water supplies and damages therefrom; pollution prevention measures and works in effect and those which appear to be needed; and the benefits to be derived from improvements for pollution control. The report states that while additional information is needed to complete the program, objectives for stream pollution control have been established and general plans for attaining them have been adopted by the States and by INCODEL.

Your report refers to the pending investigation by the Corps of Engineers to provide for a navigation channel in the Delaware River 40 feet deep between Philadelphia, Pennsylvania, and the head of Newbold Island, and thence 35 feet upstream to Trenton, New Jersey. Your report recommends investigation of upstream movement of salinity in the lower Delaware River and the effect of the deeper channel on ground water resources. Investigations to date by model tests at the U.S. Waterways Experiment Station and by an eminent consulting geologist have led to conclusions by our District and Division Engineers, and by my staff and that of the Board of Engineers for Rivers and Harbors, that the contemplated channel enlargement would not appreciably increase salinity concentrations in the project channel for normal or recorded low fresh water flows, and consequently, would not cause further contamination of ground water supplies.

It may be noted that the Corps of Engineers, pursuant to a resolution adopted 13 April 1950 by the Committee on Public Works, United States Senate, is reviewing the report on the Delaware River contained in House Document No. 179, 73rd Congress, Second Session, and supplementary reports, with a view to determining the present advisability of modifying previous recommendations. The report will review all available data, including Federal and non-Federal reports, to determine the optimum economic degree of development of the water resources of the Delaware River Basin. A study of salinity control through river flow regulation is being made in the Delaware River model at the Waterways Experiment Station.

It is believed that your report constitutes a valuable public document on the status and objectives of the clean stream program for the Delaware River. As such, it should encourage all interests and agencies in working together toward optimum use and development of the water resources of the basin. I heartily endorse the spirit of cooperation evident therein, and assure you that the Corps of Engineers will fully coordinate its activities with those of other Federal and non-Federal organizations in the further development and conservation of the waters of the Delaware River.

The opportunity of reviewing your report is greatly appreciated.

Sincerely yours,

B. L. ROBINSON
Major General
Acting Chief of Engineers